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MAKARENKOPLAX GEN. NOV. AND MAKARENKOPLACIDAE FAM. NOV. (MOLLUSCA: POLYPLACOPHORA: CHITONIDA) FROM THE PALAEOGENE OF THE UKRAINE

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ABSTRACT

A new family Makarenkoplacidae and a new genus *Makarenkoplax* gen. nov. of Polyplacophora are described from the Lower Palaeocene and the Upper Eocene of the Ukraine. The main characters of the family and genus are: depressions between the jugal and pleurolateral areas; anterior margin of pleurolateral areas strongly reduced and anterior part of jugal area projected; insertion plates strongly pectinated; tegmentum equally sculptured with small quincuncially arranged granules.

Keywords: *Makarenkoplax*, new family and genus, Paleogene chitons, Ukraine

НОВЫЙ РОД *MAKARENKOPLAX* GEN. NOV. И НОВОЕ СЕМЕЙСТВО MAKARENKOPLACIDAE FAM. NOV. (MOLLUSCA: POLYPLACOPHORA: CHITONIDA) ИЗ ПАЛЕОГЕНА УКРАИНЫ

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РЕЗЮМЕ

Новое семейство Makarenkoplacidae и новый род *Makarenkoplax* описаны из нижнего палеоцена и верхнего эоцена Украины. Главные признаки этих таксонов: депрессии между югальным и плевролатеральными полями; передний край плевролатеральных полей сильно редуцирован и передняя часть югального поля заметно выдается вперед; инсерционные пластинки гребенчатые; тегментум равномерно скульптурирован гранулами, расположенными в шахматном порядке.

Ключевые слова: *Makarenkoplax*, новые семейство и род, палеогеновые хитоны, Украина

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INTRODUCTION

Makarenko (1969) described 6 new species from the Paleogene of the Ukraine, including *Lepidochiton menneri* Makarenko, 1969 (Lower Palaeocene, Luzanovka Beds, Ukraine) and *Lepidochiton vjalovi* Makarenko, 1969 (Upper Eocene, Priabonian, Mandrikovka Beds, Chapli granite quarry, Dnepropetrovsk, Ukraine). Makarenko included them provisionally in the genus *Lepidochiton* (= *Lepidochitona*) Gray, 1821. However, *Lepidochiton menneri* and *L. vjalovi* share some unusual shell characters not previously seen in recognized polyplacophoran genera. They have intermediate and tail valves with a reduction of the pleural area. Their tegmentum is divided into jugal and pleurolateral areas like that in the species of the genus *Acanthochitona* (order Chitonida, suborder Acanthochitonina). Their insertion plates are strongly pectinated like insertion plates of *Tonicia disjuncta* (Frembly, 1827) (order Chitonida, suborder Chitonina). Their tegmentum bears granules similar to those seen in species of the genus *Leptochiton* (order Lepidopleurida). Each granule has a single megalaesthete and several micraesthetes surrounding it. The combination of these distinct shell characters is not shared by any known polyplacophoran group, and therefore leads us to describe a new genus and new family.

MATERIAL AND METHODS

The chitons studied come from two different localities. *Lepidochitona vjalovi* is from the Upper Eocene, Mandrikovka Beds, corresponding to the Priabonian (33.9–38.0 million years ago) (Amitrov 1993). This outcrop is situated on the left bank of the Dnieper River near Dnepropetrovsk, Southern part of the Ukraine. *Lepidochitona menneri* occurs in the Luzanovka Beds, corresponding to the Danian and Selandian stages (59.2–66.0 million years ago) (Makarenko 1976). This outcrop is situated near a small village of Luzanovka, south of Cherkassy, Ukraine.

The material included in this paper was received from D.E. Makarenko and O.V. Amitrov or collected by the authors. One intermediate valve of *M. vjalovi* and one intermediate valve of *M. menneri* were used for study by scanning electron microscope. Two intermediate valves, one head and one tail valves of *M. vjalovi* and one intermediate valve of *M. menneri* were photographed using a Cannon G9 camera.

SYSTEMATICS

Class Polyplacophora Gray, 1821

Subclass Loricata Schumacher, 1817

Order Chitonida Thiele, 1909

Suborder Acanthochitonina Bergenhayn, 1930

Superfamily Cryptoplacoidea H. & A. Adams, 1858

Family Makarenkoplacidae fam. nov.

Type genus. *Makarenkoplax* gen. nov.

Diagnosis. Dorsal area of intermediate valves divided into jugal and pleurolateral areas. Anterior margin of pleurolateral areas strongly reduced; anterior part of jugal area projected. Depressions between jugal and pleurolateral areas present. Apophyses very wide, connected with anterior part of jugal area, insertion plates and posterior portion of apophyses strongly pectinated. Tegmentum uniformly sculptured by small quincuncially arranged granules.

Description. Chitons of moderate or large size (probably reaching about 6 cm in length), valves heavy, low or moderately elevated (dorsal elevation 0.27–0.33), subcarinated. Tegmentum of intermediate valves divided into jugal and pleurolateral areas. Keel formed by jugal area. Anterior margin of pleurolateral areas strongly reduced and anterior part of jugal area projected. Mucro of tail valve anterior. Tegmentum uniformly sculptured with small quincuncially arranged granules, except smooth top of jugal area. Each granule with single megalaesthete surrounded by 6–10 micraesthetes.

Articulamentum well developed, apophyses very wide, connected to anterior part of jugal area, insertion plates and posterior portion of apophyses strongly pectinated, slit formula many /1–4/ many, slit openings very small and imperceptible.

Remarks. Makarenkoplacidae fam. nov. has a characteristic arrangement of aesthetes on granules, which resembles that of more primitive families (Lepidopleuridae, Ferreiraellidae, Protochitonidae) of the order Lepidopleurida. At the same time, the new family has a strongly reduced tegmentum, as seen in the families Acanthochitonidae and Mopaliidae of the suborder Acanthochitonina, and strongly pectinated insertion plates and the posterior portion of the apophyses, similar to those of the family Chitonidae of the suborder Chitonina. In view of the slitted insertion plates, we included the new family in the

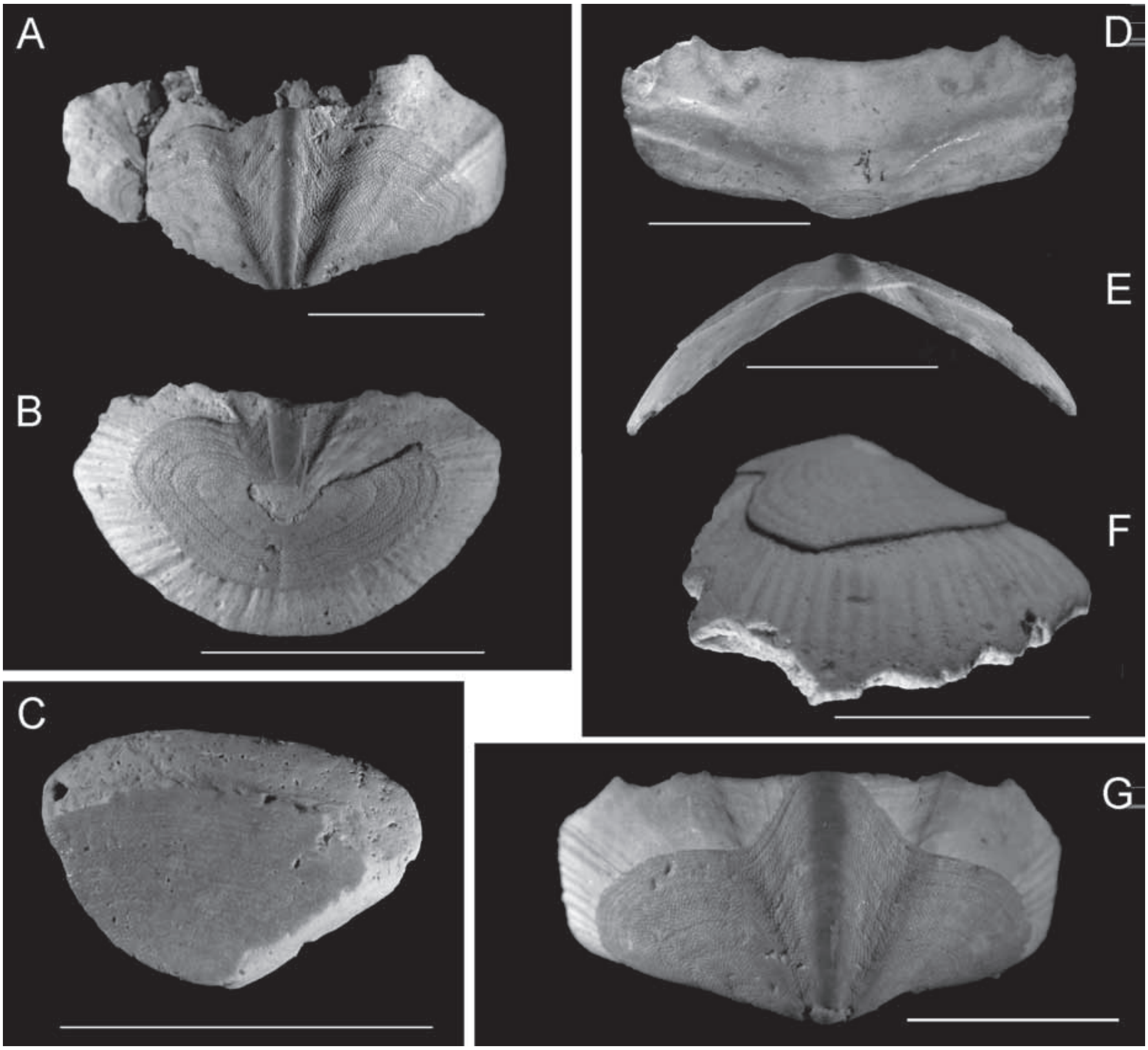


Fig. 1. *Makarenkoplax vjalovi*. A – intermediate valve, dorsal view; B – tail valve, dorsal view; C – part of head valve, dorsal view; D – intermediate valve, frontal view; F – tail valve, lateral view; G – intermediate valve, dorsal view. Scale bars: 10 mm (A–E, G) and 5 mm (F).

order Chitonida. A strongly reduced tegmentum, the presence of a jugal keel on the intermediate valves, and the presence of granules with aesthete pores on them are characters of the family Acanthochitonidae. We therefore place Makarenkoplacidae fam. nov. in the suborder Acanthochitonina, superfamily Cryptoplacoidea.

Genus *Makarenkoplax* gen. nov.

Type species. *Lepidochiton vjalovi* Makarenko, 1969, Upper Eocene.

Diagnosis. As for diagnosis of family.

Etymology. Named after D.E. Makarenko (Institute of Geological Sciences, Ukrainian Academy of Sciences, Kiev, Ukraine), who made a significant contribution to the study of Eocene and Palaeocene molluscs.

Occurrence. Lower Palaeocene, Luzanovka Beds and Upper Eocene, Mandrikovka Beds, Ukraine.

Remarks. *Makarenkoplax* gen. nov. includes two species: *Makarenkoplax vjalovi* (Late Eocene) and *M. menneri* (Lower Palaeocene). It is possible that the new genus originated in the Lower Palaeocene

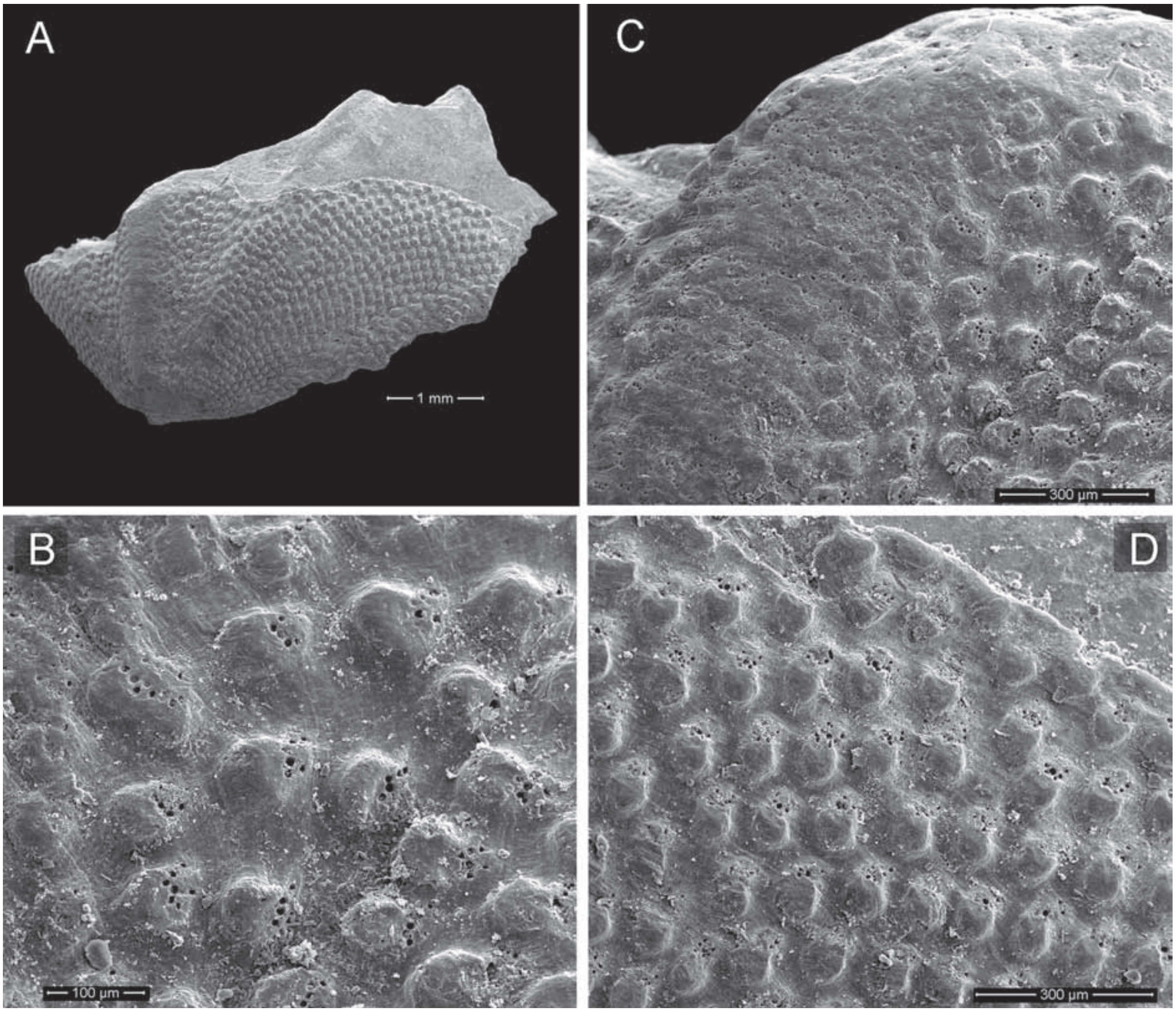


Fig. 2. *Makarenkoplax vjalovi*. A – intermediate valve, dorsal view; B, C – intermediate valve, jugal area and depression, D – intermediate valve, pleurolateral area.

and existed for at least ~25 million years (up to the Late Eocene) in the northern Tethys.

Makarenkoplax shows some similarity to *Heterochiton* Fucini, 1912. Both genera have depressions near the jugal area and a granulated tegmentum. The new genus is also similar to *Allochiton* Fucini, 1912. However, *Makarenkoplax* differs from both *Heterochiton* and *Allochiton* by the absence of a sinus in the tail valve and the presence of a strong pectination on the insertion plates.

The new genus differs from other genera of the superfamily Cryptoplacoidea in having strongly pectinated insertion plates and posterior portion of the apophyses.

***Makarenkoplax vjalovi* (Makarenko, 1969)**
(Figs 1A–G, 2A–D, 3A, B, D, 5A, E)

Lepidochiton vjalovi Makarenko, 1969: 30, figs. 23, 24; Bielokrys, 2000: 51, pl. IV, figs. 12, 13.

Type material. Holotype, Geological Museum of the Institute of Geological Sciences, Ukrainian Academy of Sciences, № 21/1.

Type locality. Upper Eocene, Mandrikovka Beds, Dnepropetrovsk, Ukraine.

Material examined. Eleven incomplete intermediate valves, one head valve and two tail valves, collected in Mandrikovka Beds, Dnepropetrovsk,

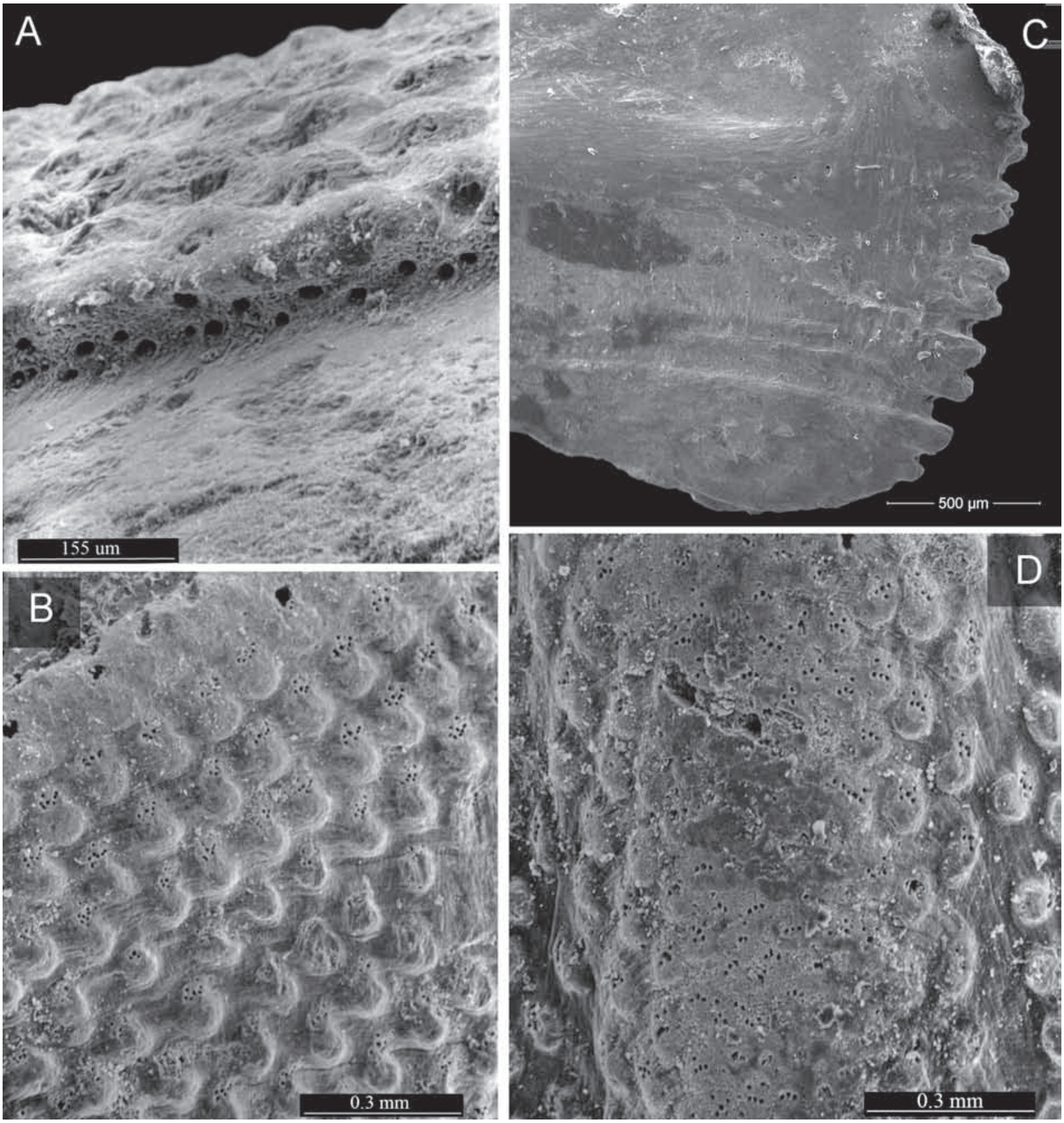


Fig. 3. *Makarenkoplax vjalovi* (A, B, D) and *M. menneri* (C). A – intermediate valve, eaves, B – intermediate valve, depression between jugal and pleurolateral areas; C – intermediate valve, ventral view, insertion plates and 4 slits. D – intermediate valve, jugal area.

Ukraine, by O.A. Amitrov (1979–1983), B.I. Sirenko (2002) and B. Dell'Angelo (2013).

Revised diagnosis. Large chiton, body length of up to about 60 mm, shell subcarinated, low elevated (dorsal elevation ratio 0.27). Intermediate valves splayed laterally. Two deep depressions in tegmentum of intermediate and tail valves present between jugal and pleurolateral areas. Tail valve with anterior mucro, ratio of length of postmucronal area to length of antemucronal area 1.4. Apophyses and insertion plates very long, insertion plates and hind of apophyses strongly pectinated. Length of insertion plates

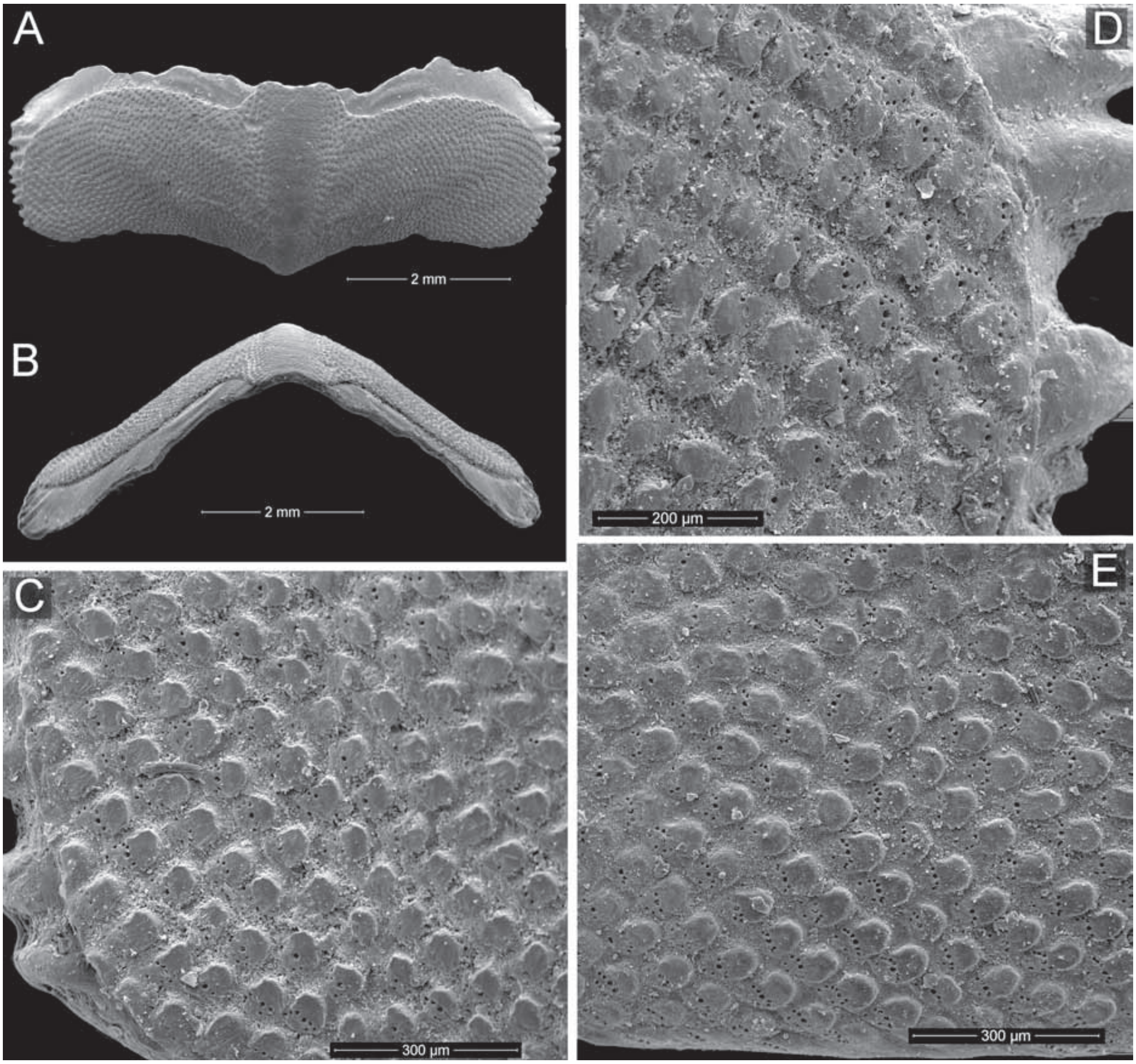


Fig. 4. *Makarenkoplax menneri.* A – intermediate valve, dorsal view; B – intermediate valve, frontal view; C, D – intermediate valve, pleurolateral area, tegmentum and insertion plates; E – intermediate valve, pleurolateral area.

only 10 times less than width of intermediate valves. Surface of tegmentum uniformly sculptured with small granules, except smooth top of jugal area, each granule with 1 megalaesthete and 6 micraesthetes placed on its distal part. Slit formula many/1/many.

Occurrence. Known only from the type locality.

***Makarenkoplax menneri* (Makarenko, 1969)**
(Figs 3C, 4A–E, 5B–D)

Lepidochiton menneri Makarenko, 1969: 29, figs 13–16.

Allochiton menneri – Makarenko, 1976: 165, pl. XVIII, figs. 13, 14, 17, 18.

Type material. Holotype, Geological Museum of the Institute of geological sciences, Ukrainian Academy of Sciences № 20/14.

Type locality. Lower Palaeocene, Luzanovka Beds, Luzanovka village, Ukraine.

Material examined. Fifteen incomplete intermediate valves collected in Luzanovka Beds, Luzanovka village, Ukraine, by D.E. Makarenko (1968) and B.I. Sirenko (2002).

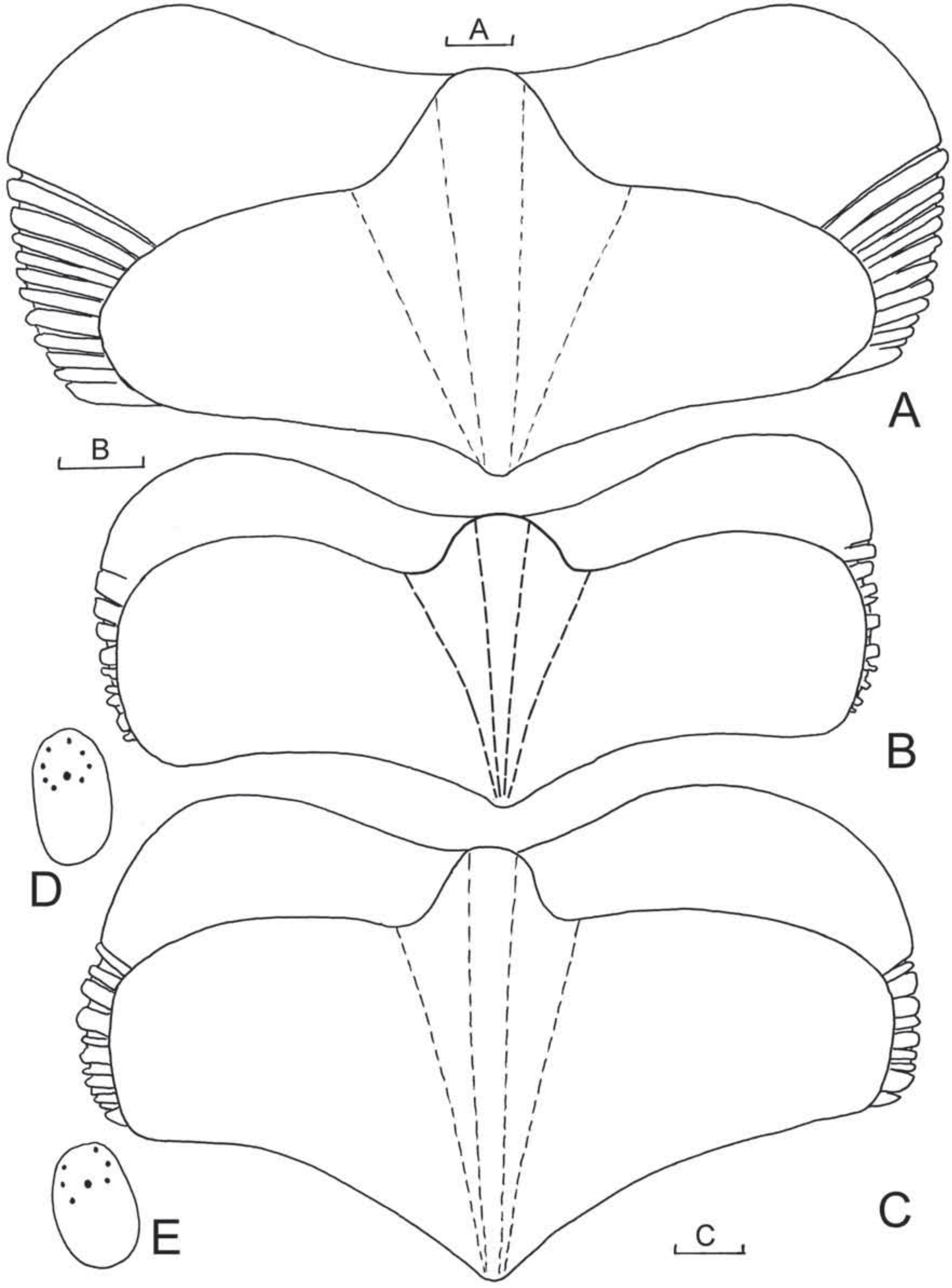


Fig. 5. *Makarenkoplax vjalovi* (A, E) and *M. menneri* (B–D). Reconstruction of intermediate valves (A–C) and aesthete elements (D, E). Dotted lines show the border of jugal area and depression between jugal and pleurolateral areas. Scale bar: (A, B, C) 1 mm.

Revised diagnosis. Large chiton, body length of up to about 40–45 mm, shell subcarinated, moderately elevated (dorsal elevation ratio 0.33). Intermediate valves rectangular, jugal area noticeably protruded anteriorly, apex well projecting. Depressions between jugal and pleurolateral areas in tegmentum of intermediate and tail valves weakly marked. Mucro of tail valve anterior, ratio of length of postmucronal area to length of antemucronal area 1.8. Apophyses long, insertion plates short, length of insertion plates 30 times less than width of intermediate valve. Surface of tegmentum uniformly sculptured with small granules, except smooth top of jugal area, each granule with 1 megalaesthete and 8–10 micraesthetes placed on its distal part. Slit formula many?/4/many.

Occurrence. Known only from the type locality.

Comparison. *Makarenkoplax vjalovi* differs from *M. menneri* by its stronger depressions between the jugal and pleurolateral areas, its longer insertion plates, the shape of its intermediate valves, which are splayed laterally, its longer antemucronal area and fewer micraesthetes in the aesthete structure.

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